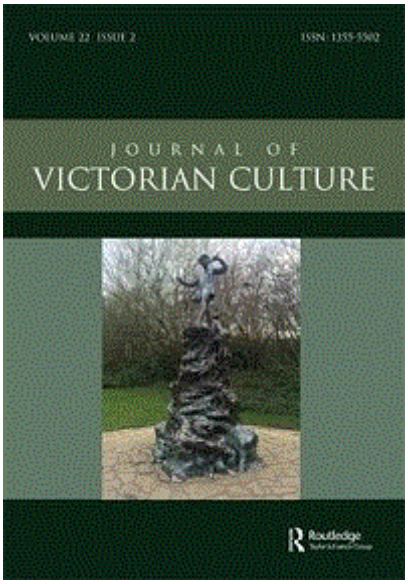

'Epidemics in a Mist': Medical Climatology and Cholera in Victorian Visual Culture

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Title
'Epidemics in a Mist': Medical Climatology and Cholera in Victorian Visual Culture

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Abstract
The article explores how Victorian visual culture was a vital force in the construction and dissemination of medical theories on the connection between climate and health. During the nineteenth century, the seemingly inexplicable and deadly nature of many epidemic diseases compelled British medics to investigate all possible reasons for their spread. Focusing on cholera, the article will examine how, in an effort to understand what was seen at the time as a mysterious disease, Victorian medics increasingly concentrated on the climate of India and

unusual weather in Britain as propagators of the malady. Supplementing the dominant miasma theory, medics explained how the seemingly airborne sources of cholera resulted from a state of England's air that resembled the tropical environment of the subcontinent. In an effort to highlight the correlation between cholera and the atmosphere, they produced medical climatology reports containing diagrams that juxtaposed the data on the disease's mortality rates with measurements of meteorological phenomena. These images, rather than serving simply as illustrations, became a crucial part of medical arguments. As the article will demonstrate, in attempting to visualize the medical climatology of cholera, the diagrams mapped the disease to certain atmospheric conditions, suggesting that cholera could be quantified and controlled. Yet, in doing so, the images also implied that cholera had a real material presence in the air of Britain, powerfully evoking visual tropes of the disease as a substance that had the potential to contaminate the very landscape of the nation.

Keywords
Cholera epidemics, miasma, Victorian visual culture, medical climatology, medical meteorology, nineteenth-century medical images, Victorian scientific illustration, British Empire and India, tropical disease, climate and health

List of Abbreviations

AMJ	*Association Medical Journal*
GBH	General Board of Health
SDUK	Society for the Diffusion of Useful Knowledge

‘Epidemics in a Mist’: Medical Climatology and Cholera in Victorian Visual Culture

With Britain’s imperial expansion into new tropical environments in the eighteenth and nineteenth centuries, and the subsequent negative effects these climates seemingly had on the health of the British body, medics began to believe that tropical climates and irregular meteorological phenomena were sources of disease. Taking the emergence of cholera in India in 1817 and the four epidemics that struck Britain in 1831–32, 1848–49, 1853–54, and 1866 as a case study, my article will show how malignant diseases like cholera took shape in the Victorian visual imagination as an elusive atmospheric phenomenon that suggested England’s air was being transformed into the sickly climate of the tropics. In an effort to highlight the correlation between climate and disease, British medics produced images that juxtaposed the data on climatic conditions with statistics of disease mortality. These diagrams, often filled with detailed information, attempted to map illness to a certain environment and to legitimate this connection through the form of scientific representation. Such images, rather than serving simply as illustrations, became a crucial part of medical arguments.

Cholera would have a significant social and cultural impact on nineteenth-century Britain. As the work of several leading scholars has shown, cholera was connected to various issues, including poverty, immorality, racial degeneration, sanitarian reform, and tropical medicine. It was used to shape ideas on public health, the nation and empire, and the social body in Victorian Britain.[1] Historians Vladimir Jankovic and Projit Bihari Mukharji have

[1] See Norman Longmate, *King Cholera: The Biography of a Disease* (London: Hamish Hamilton, 1966); Margaret Pelling, *Cholera, Fever and English Medicine, 1825–1865* (Oxford: Oxford University Press, 1978); Frank Mort, *Dangerous Sexualities: Medico-Moral Politics in England since 1830* (London: Routledge and Kegan Paul, 1987); David Arnold, ‘Cholera: Disease as Disorder,’ ch. 4 in *Colonizing the Body: State Medicine and Epidemic Disease in Nineteenth-Century India* (Berkeley: University of California Press, 1993); Anne Hardy, ‘Cholera, Quarantine and the English Preventive System, 1850–1895,’ *Medical History* 37 (1993): 250–269; Mary Poovey, *Making a Social Body: British Cultural Formation, 1830–1864* (Chicago: University of Chicago Press, 1995); Alan Bewell, ‘Cholera, Sanitation, and the Colonial Representation of India,’ ch. 7 in *Romanticism and Colonial Disease* (Baltimore: Johns Hopkins University Press, 1999); Erin O’Connor, ‘Asiatic Cholera and the Raw Material of Race,’ ch. 1 in *Raw Material: Producing Pathology in Victorian Culture*

both published texts that investigate Victorian medical theories on cholera and meteorological phenomena, arguing that Victorian physicians made correlations between cholera and specific weather conditions, particularly with a type of dense cloud.[2] While much of the scholarship is based primarily on textual sources, it does not address the imagery of the disease and offers little concern about the particular power of the visual. Building on and advancing this historiography, particularly on the work of Jankovic and Mukharji, the article will demonstrate that as each epidemic swept through England, Victorians increasingly believed cholera weather did exist and employed images to legitimize this theory. Further, as Upamanyu Pablo Mukherjee shows, nineteenth-century narratives of imperial palliative care emphasized that only Britons, armed with expertise in medicine and science, could maintain social order in the tropics. Yet, the very technologies they employed could highlight a troubling closeness with their Indian subjects, 'a proximity that rapidly erodes the sense of racial and cultural difference.'[3] Applying Mukherjee's method, the article will discuss how the use of diagrams informed by careful scientific investigation, and the aesthetic choices that were made to visualize atmospheric and mortality data, created both intentional and unintentional meanings that ultimately suggested an uncomfortable affinity between the British and Indian climate.

The nineteenth-century association of climate with disease was based on an established tradition of believing that meteorological phenomena had an effect on health and illness. Medical climatology emerged in the eighteenth century amid growing fears over epidemic disease and environmental hazards. Drawing on ideas from Hippocrates to Thomas

(Durham, NC: Duke University Press, 2000); Pamela K. Gilbert, *Cholera and Nation: Doctoring the Social Body in Victorian England* (New York: State University of New York Press, 2008); and Christopher Hamlin, *Cholera: The Biography* (Oxford: Oxford University Press, 2009).

[2] Vladimir Jankovic, 'Gruff Boreas, Deadly Calms: A Medical Perspective on Winds and the Victorians,' *Journal of the Royal Anthropological Institute* N.S. (2007): S153–S156; and Projit Bihari Mukharji, 'The "Cholera Cloud" in the Nineteenth-Century "British World": History of an Object-Without-an-Essence,' *Bulletin of the History of Medicine* 86 (2012): 304–305, 319–320, and 326–327.

[3] Upamanyu Pablo Mukherjee, *Natural Disasters and Victorian Empire: Famines, Fevers and the Literary Cultures of South Asia* (New York: Palgrave Macmillan, 2013), 139 and 165.

Sydenham and Robert Boyle, eighteenth-century physiologists increasingly viewed air as having an active effect on the operations of the body and as a source of various types of illnesses.[4] The belief that air affected human health would remain a concern into the Victorian period. For instance, the physician John Charles Atkinson wrote a series of articles in the *Lancet* about the influence of winds on the body, while the medic Alfred Haviland concluded that 'climate is the grand modifier of disease.'[5]

Medical climatology also developed during the period in which Britain's empire was expanding into new environments. As the British East India Company increased its trade and settlement in India, and as the subcontinent grew in importance as an imperial possession, more attention was paid to its climate.[6] According to historian Mark Harrison, initially, British physicians believed that Europeans could acclimatize to the Indian environment; however, by the mid-nineteenth century, the British began viewing India's climate as a threat to European health. As Harrison points out, such factors as higher death rates among Europeans, along with fears of racial degeneration brought about by the tropical atmosphere, led to the opinion that the climate of India was dangerous to the British body.[7]

Indeed, the subcontinent was marked as possessing a climate of illness. It was described as being 'full of the seeds of disease and premature death,' with various forms of dysentery and fevers cited as some of the illnesses that afflicted European travellers.[8] Moreover, India was associated with miasma (emissions from decaying organic matter

[4] Vladimir Jankovic, *Confronting the Climate: British Air and the Making of Environmental Medicine* (New York: Palgrave Macmillan, 2010), 4–5 and 17.
[5] J. C. Atkinson, 'On the Influence of the Winds; and Enumeration of Apparatus Employed in Meteorological Observations,' *Lancet* 53, no. 1342 (1849): 533; and J. C. Atkinson, 'On the Influence of the Winds; and Apparatus Employed in Meteorological Observations,' *Lancet* 54, no. 1352 (1849): 91; and Alfred Haviland, *Climate, Weather, and Disease; Being a Sketch of the Opinions of the Most Celebrated Ancient and Modern Writers with Regard to the Influence of Climate and Weather in Producing Disease* (London: John Churchill, 1855), 11.
[6] Mark Harrison, *Climates and Constitutions: Health, Race, Environment and British Imperialism in India, 1600–1850* (New Delhi: Oxford University Press, 1999), 4–5.
[7] Harrison, *Climates*, 11–12, 16–18, 25–26, 56, 102, and 114–115.
[8] Society for the Diffusion of Useful Knowledge (SDUK), *The Working-Man's Companion. The Physician: I. The Cholera* (London: Charles Knight, 1832), 80; and James Ranald Martin, *Notes on the Medical Topography of Calcutta* (Calcutta: G. H. Huttman, Bengal Military Orphan Press, 1837), 107–108.

blamed for spreading disease). According to medics, the high temperatures, humidity, and stagnant air of the tropical climate permitted vegetation to grow in abundance, but these conditions also led to the rapid decay of matter in the soil. Subsequently, the moisture in the warm atmosphere allowed miasmas from the ground to contaminate the air and produce disease.[9] The soil and climate also supposedly made illnesses more prevalent and severer in character. As the surgeon James Kennedy asserted, 'it is not surprising to find, therefore, that many maladies, previously known only in a mild shape, should, in such a concentration of misery, become exceedingly virulent, or that some non-contagious distemper, occurring casually at the time, should suddenly assume a contagious form.'[10]

With the emergence of a fatal form of cholera in India in 1817, British government officials and medics argued that the climate of the subcontinent, well known for its insalubrious qualities, also created this malignant new malady. Kennedy believed that deviations in the weather and heavy rain in 1817 'were circumstances sufficient of themselves to change the character of cholera.'[11] Reports by surgeons in India, such as Reginald Orton and James Annesley, stressed that cholera was 'well-known as a disease of tropical climates and warm seasons.' Cholera was 'dependent upon the climate and intertropical position of the Indian territories' and 'upon certain states and changes of the atmosphere.'[12] Moreover, the origin of the disease was connected to a specific location in India: the sunderbunds of Bengal.[13] Potential visitors to the province were given a picture of a landscape in which under a hot sun 'malarious vapours are seen coiling themselves up from the surface of the land, which presents the unbroken aspect of an endless swamp, covered

[9] James Annesley, *Researches into the Causes, Nature, and Treatment of the More Prevalent Diseases of India, and of Warm Climates Generally* (London: Longman, Rees, Orme, Brown, and Green, 1828), 1: 70–71.
[10] James Kennedy, *The History of the Contagious Cholera; with Facts Explanatory of its Origin and Laws, and of a Rational Method of Cure*, 2nd ed. (London: James Cochrane and Co., 1832), 13.
[11] Kennedy, *Contagious Cholera*, 16 and 18–19.
[12] Reginald Orton, *An Essay on the Epidemic Cholera of India*, 2nd ed. (London: Burgess and Hill, 1831), v; and James Annesley, *Sketches of the Most Prevalent Diseases of India: Comprising a Treatise on the Epidemic Cholera of the East* (London: Thomas and George Underwood, 1825), 4 and 5.
[13] Kennedy, *Contagious Cholera*, xiii; and Orton, *Epidemic Cholera*, 320 and 329.

with low, black, impenetrable jungle.'[14] The sunderbunds (a forest created by the rich soil of the Ganges Delta) posed a significant danger, according to Annesley, because they were so dense that they allowed plants to decay in the moist soil, creating pestilential miasma.[15] By the end of the second epidemic, the natural condition in which cholera propagated was officially reported by the General Board of Health (GBH) as a still, moist, and hot atmosphere that was preceded by the prevalence of dry, cold winds — conditions common to central India. While the GBH acknowledged that these atmospheric states were likely accessory causes to cholera, they were seen as having acquired 'peculiar force' in the intense climate of India.[16]

The arrival of cholera in England in 1831 prompted British physicians and government officials to determine how it spread. Many theories were put forth, with medics first assuming that it was a contagion carried by travellers and goods.[17] This belief soon gave way to what would become the dominant theory for how cholera propagated: the miasma theory. Supported by the GBH, the theory posited that cholera was generated by pestilential emanations from decomposing organic matter.[18] The miasma theory was so widely accepted that it even supplanted the more accurate water-borne theory posited by the physician John Snow, which asserted that the illness was spread through the consumption of drinking water contaminated by the faecal matter of cholera sufferers.[19] It was, therefore, widely believed that cholera was mainly propagated by contaminated air and the deadly vapours emitted by polluted water.[20] The miasma theory, though, was not completely sufficient, so medics turned

[14] Kennedy, *Contagious Cholera*, 1–2.
[15] Annesley, *Researches*, 1: 51–59.
[16] General Board of Health (GBH), *Report of the General Board of Health on the Epidemic Cholera of 1848 and 1849* (London: W. Clowes and Sons, 1850), 28 and 29.
[17] 'History of the Rise, Progress, Ravages, &c. of the Blue Cholera of India,' *Lancet* 17, no. 429 (1831): 261 and 267.
[18] GBH, *Report…1849*, 32, 36, 73, 81–82, and 146–147.
[19] John Snow, *On the Mode of Communication of Cholera*, 2nd ed., enlarged (London: John Churchill, 1855), 22–23.
[20] GBH, Medical Council, *Report of the Committee for Scientific Inquiries in Relation to the Cholera-Epidemic of 1854* (London: George E. Eyre and William Spottiswoode, 1855), 37–38, 41–45, 47, and 48.

to the study of climatic phenomena to explain why epidemics of what was seen as an Indian disease occurred in England. Early opinions about the source of the first outbreak posited that the summer and autumn were unusual in 1831 for the numerous thunderstorms and violent gales of wind experienced in England.[21] During the 1850s, the physician J. A. Hingeston published several articles describing the weather of each epidemic. He noticed that during the epidemics, the atmosphere was calm and heavy, the sky was overcast and dark, and the winds were 'damp and unhealthy.' The sunshine was, according to Hingeston, 'pale and watery, and of a sickly brightness' and there was also 'a sticky moisture pervading everything.' Through his findings, Hingeston concluded that cholera was associated with a torpid mist, an overcast sky, and high barometric pressure and temperature.[22]

One phenomenon in particular — a thick coloured mist — soon became a marker of cholera's presence and a sign that England's air was actually being transformed, made sickly, through the existence of a foreign disease. Orton mentioned hearing of a 'large black cloud' accompanying an outbreak at Seroor, which had 'received the name of the *cholera cloud*.'[23] In England, cholera's manifestation in the air took on the very specific form of a mist often described as being tinted blue or grey. The meteorologist James Glaisher, from Greenwich Observatory, stated that the height of the third epidemic 'was ushered in with a dense blue mist,' which was then 'exchanged for a thick atmosphere of fog.' Looking back, he asserted that all of the cholera epidemics were 'characterized by a prevalent mist, thin in high places, dense in low.'[24] Haviland also mentioned that 'stinking fogs' and a 'sickly odour' peculiar to the disease were present during an outbreak, noting that this haze 'was of a pale blue'

[21] SDUK, *Cholera*, 77–78. See also Annesley, *Sketches*, 12; and William Farr, *Report on the Mortality of Cholera in England, 1848–49* (London: W. Clowes and Sons, 1852), xx.
[22] J. A. Hingeston, 'Atmospheric Phenomena in Relation to the Prevalence of Asiatic Cholera,' *Association Medical Journal* (*AMJ*) 1, no. 42 (1853): 927–928; J. A. Hingeston, 'Meteorology of Cholera,' *AMJ* 2, no. 100 (1854): 1075; J. A. Hingeston, 'Meteorological Observations on Cholera,' *AMJ* 2, no. 97 (1854): 1016; and J. A. Hingeston, 'The Cholera Weather,' *AMJ* 4, no. 187 (1856): 649.
[23] Orton, *Epidemic Cholera*, 174.
[24] James Glaisher, 'Report upon the Meteorology of London in Relation to the Cholera-Epidemic of 1853–4,' in GBH, Medical Council, *Appendix to the Report of the Committee for Scientific Inquiries in Relation to the Cholera-Epidemic of 1854* (George E. Eyre and William Spottiswoode, 1855), 105 and 116.

colour.[25] These mists, the GBH posited, were miasmas, which were often portrayed as infectious or pestilential fogs.[26] Others described them as atmospheric phenomena. Hingeston stated that the mist was 'of a dim grey colour,' which he compared to the painting technique of scumbling. The mist, he continued, 'rolls off the higher places, descends into the vales and hollows, and settles in corners secluded from the thoroughfare and draughts of air.' Hingeston pointed out that it also 'obscures everything, and makes it feel sticky,' suggesting the mist had substance.[27] During the fourth epidemic, Glaisher noted that

> one of the most remarkable atmospheric phenomena during the past quarter has been the prevalence of a peculiar blue mist […]. It has extended from Aberdeen to the Isle of Wight, and is of the same tint of blue everywhere. This mist increased in intensity when viewed through a telescope; usually no mist can be seen when thus viewed; it increased in density during the fall of rain; usually mist rises after the fall of rain. Its density did not decrease when the wind was blowing moderately strong, but did decrease when a gale was blowing, but increased again on its subsidence.[28]

In his account, the blue mist was composed of matter that was thick, heavy, and immovable, and had spread across the entire nation. It seemed to loom in the air. It could also taint the environment, as Glaisher observed that the mist extended to the treetops and coloured blue nearby objects.[29] The mist even entered the Victorian imagination, with medics using atmospheric imagery to describe cholera. For instance, 'Epidemics in a Mist' was the subtitle for an 1866 *Lancet* article on cholera and, speaking of the fourth epidemic, the statistician William Farr, who worked in the General Register Office, described how cholera, 'hanging like a black cloud over the city, threatened not just East London but the whole metropolis with an overwhelming plague.'[30] Furthermore, one writer even speculated in a letter to *The Times* that 'there may be a necessary relation between the blue matter forming the mist and

[25] Haviland, *Climate*, 129 and 141.
[26] GBH, *Report…1854*, 33; Farr, *Report…1848–49*, xcvi; and Glaisher, 'Report,' 99–100.
[27] Hingeston, 'Asiatic Cholera,' 927 and 928; and Hingeston, 'Cholera Weather,' 649.
[28] Quoted in 'London: Saturday, November 3, 1866,' *Lancet* 88, no. 2253 (1866): 497.
[29] James Glaisher, 'The Cholera Mist Again,' letter to the editor, *The Times*, 7 August 1866, 12.
[30] 'Medical Annotations. Epidemics in a Mist,' *Lancet* 88, no. 2241 (1866): 155–157; and William Farr, *Report on the Cholera Epidemic of 1866 in England* (London: George E. Eyre and William Spottiswoode, 1868), xxxii.

the well-known blue stage of cholera.'[31] The colour blue became associated with cholera from the very beginning. Medics noted that the skin of cholera sufferers often assumed a livid, leaden, or blue tint, while the countenance displayed a cadaverous aspect, which helped distinguish it from other diseases.[32] In 1832, the *Lancet* published the first image of a cholera victim in England to provide 'a clear and unexaggerated idea of the peculiar leaden hue of the face, hands, and feet.'[33] Titled *Blue Stage of the Spasmodic Cholera*, the illustration depicts a girl with sunken eyes and cheeks, bony hands and feet, and skin turned blue as a result of the dehydrating effects of the illness. Confronted by a disease that visibly transformed the body, tainting the sufferer's skin blue and giving them a corpse-like appearance, British meteorologists and medics provided a clear identifier of cholera's weather. Like its effects on the body, the climate in which cholera thrived shared this sickly physical manifestation. As the GBH claimed, Glaisher was able to by sight 'connect one tint of mist with the prevalence of cholera, [and] another with the prevalence of influenza.'[34] The colour of a mist was, therefore, reflective of the type of disease that could develop. The blue disease was ostensibly transmitted by a blue mist.

While much of the information about the connection between cholera and climate was textual, images were created to help summarize and compare meteorological and epidemiological data in an effort to try to understand the disease. The forms that these images took were those of diagrams. Most of the images were large colour foldouts bound with, but separated from their reports. Brief explanations of the diagrams were provided in some of the texts, but others did not mention them at all. More importantly, since the images had to be

[31] Y, 'Blue Mist,' letter to the editor, *The Times*, 10 August 1866, 5.
[32] Kennedy, *Contagious Cholera*, 262; Orton, *Epidemic Cholera*, 2–3; and 'Blue Cholera,' *Lancet*, 253–254.
[33] 'History of the Progress of the Malignant Cholera in England and Scotland,' *Lancet* 17, no. 440 (1832): 680.
[34] GBH, *Report…1854*, 32. In the Victorian imagination, the cholera mist was also different from other types of fog because of its blue colour. For instance, according to Peter Brimblecombe, fog was common along the Thames, but in the nineteenth century these fogs became associated with air pollution. By the 1840s, the colour of London fog was described as black, brown, and yellow (Brimblecombe, *The Big Smoke: A History of Air Pollution in London since Medieval Times* (London: Methuen, 1987), 109 and 125). Therefore, for Victorians, the blue tint associated with the cholera mist indicated that it was distinct from the air pollution of London and was a sign of the presence of the disease in the air.

unfolded in order to view them, in fact, some were quite large once unfolded, the meteorological diagrams stood apart from the reports. They demanded to be viewed and studied on their own. As Lorraine Daston and Peter Galison demonstrate in their work on objectivity, scientific images tried to map the discipline they served, acting as guides that showed practitioners what was worth studying, how it looked, and how it should be viewed.[35] Scientific images made phenomena more understandable and, at the same time, reaffirmed this knowledge to be true through the visual. Speaking on the development of weather maps in the nineteenth century, the historian Katharine Anderson explains how they were used to picture what were often invisible forces, and promised rapid, accessible, and transparent knowledge — or visual insight. Anderson is careful to point out that these maps also likely presented problems of interpretation and underlined the lack of clear definitive meaning, seemingly representing a shift from fact to opinion instead of knowledge.[36] Indeed, as the geographer Tom Koch claims in his study of the history of medical cartography, disease maps do not chart data; rather, they 'map theories using data to present them in place.'[37] Similarly, Victorian medical climatology diagrams depicted carefully collected data through visually striking methods to support the theory that there was in fact a correlation between the atmosphere and cholera; however, in legitimating this connection through scientific representation, the images revealed that England possessed a climate that propagated epidemics of an ostensibly Indian disease.

Images published in reports by Farr and Glaisher on the second and third epidemics affirmed the atmospheric nature of cholera first through the relationship between mortality and elevation. For Farr, Glaisher, and the GBH, the statistical investigations they conducted during the epidemics appeared to prove that a relationship between elevation and cholera was

[35] Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone Books, 2007), 23.
[36] Katharine Anderson, *Predicting the Weather: Victorians and the Science of Meteorology* (Chicago: University of Chicago Press, 2005), 191 and 201.
[37] Tom Koch, *Disease Maps: Epidemics on the Ground*. (Chicago: University of Chicago Press, 2011), 5.

more consistent than any other known factor, as the disease was seen to be most fatal in low areas where the greatest quantity of putrid matter was found.[38] Farr claimed that elevation had 'an important effect on life and health,' as low areas collected organic decomposition and produced emanations that 'ascend like smoke' to mix with the atmosphere.[39] Glaisher asserted that 'air is the receptacle for all vapours and impurities arising from evaporation and exhalation;' therefore, in calm weather, vapours were maintained in the lower stratum of the atmosphere, subjecting inhabitants to their 'poisonous influence.'[40] According to the GBH, this belief was reinforced by the meteorological history of London, which apparently showed that higher levels were healthier because they were comparatively clear of mist and benefitted from free ventilation.[41] Elevation was tied to a larger climatological argument by describing miasma as an atmospheric phenomenon in similar terms to the cholera mist. Farr stated how 'exhalations are often seen rising at the bottoms of valleys, over rivers, wet meadows, or low streets,' concluding that the 'amount of organic matter […] in the atmosphere we breathe […], will differ at different elevations.'[42] Within London, the GBH noted, the Thames emitted 'incessant and vast volumes of vapour' that 'hovered over the city, thickened its atmosphere, [and] occasioned the frequent prevalence of fog and mist.'[43] Both Farr's *Diagram Representing the Mortality from Cholera in Different Elevations* [Figure 1] and Glaisher's *Diagrams. Representing the Mortality from Cholera and Diarrhoea in Districts at Different Elevations in London* [Figure 2] make visible the influence of elevation on cholera mortality. The diagrams are aligned on the page in a rough column, with the highest elevation at the top and the lowest at the bottom, and the width of the column marking out mortality rates. Thinner sections demonstrate lower mortality and wider ones higher mortality. As the

[38] Farr, *Report…1848–49*, lxi; Glaisher, 'Report,' 99–100; and GBH, *Report…1854*, 15–16 and 33–34.
[39] Farr, *Report…1848–49*, lxix–lxx.
[40] Glaisher, 'Report,' 41 and 100.
[41] GBH, *Report…1854*, 48–49.
[42] Farr, *Report…1848–49*, lxx.
[43] GBH, *Report…1854*, 27.

viewer moves down the page, they can see how the mortality of cholera increases as the elevation decreases. Glaisher also accounted for discrepancies in the elevation theory.

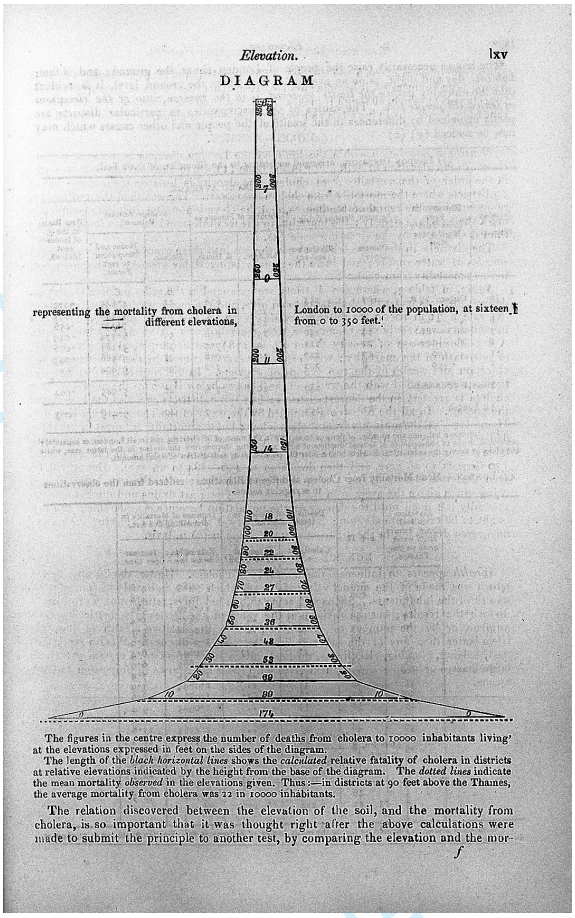

Figure 1: *Diagram Representing the Mortality from Cholera in Different Elevations*, in William Farr, *Report on the Mortality of Cholera in England, 1848–49* (London: W. Clowes and Sons, 1852), lxv. Wellcome Library, London. Credit: Wellcome Collection.

Diagram I reveals a slight increase of mortality at an elevation of 65 feet, which appears as a widened bump, a visible peculiarity on an otherwise fairly uniform column. Two words in parentheses, 'Golden Square,' are meant to explain this inconsistency. This was the outbreak associated with the Broad Street pump, which took place well above the apparently noxious low elevations of London, but was explained as possessing the same filthy and miasma-filled air as these lower areas.[44] What is most interesting about Glaisher's diagram is the use of colour, yellow for diarrhoea and blue for cholera. In both Glaisher's and Farr's graphs, the

[44] GBH, *Report…1854*, 49–52.

widening base creates a pooling quality from the top to the bottom of the page, visually reflecting the belief that cholera settled in low elevations and diminished in the cleaner air of higher areas.

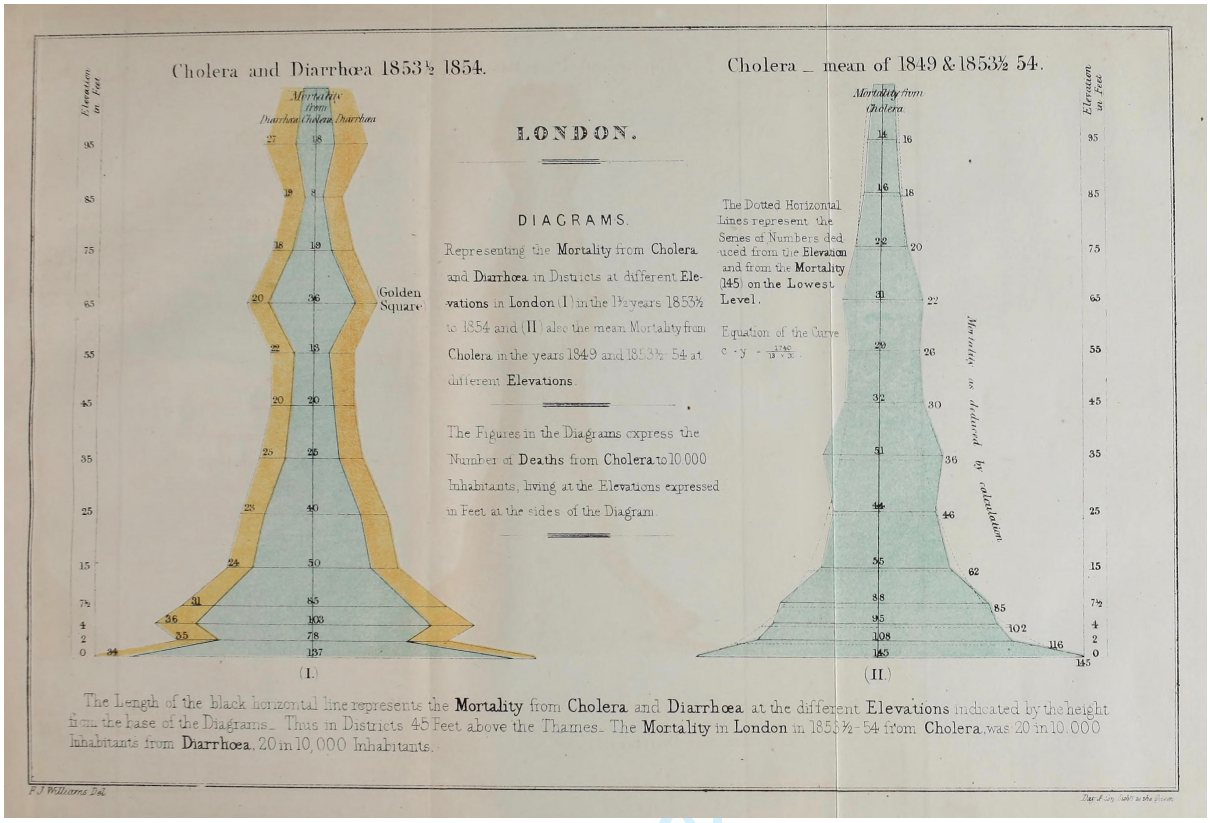

Figure 2: *Diagrams. Representing the Mortality from Cholera and Diarrhoea in Districts at Different Elevations in London*, in James Glaisher, 'Report upon the Meteorology of London in Relation to the Cholera-Epidemic of 1853–4,' in GBH, Medical Council, *Appendix to the Report of the Committee for Scientific Inquiries in Relation to the Cholera-Epidemic of 1854* (George E. Eyre and William Spottiswoode, 1855), facing p. 32. Wellcome Library, London. Credit: Wellcome Collection.

This is especially evident in Glaisher's diagram, as the blue colour of cholera's mortality recalls the dense blue mist gathering in the low areas of the land. Both images visually supported the theory that miasma was matter that concentrated in lower elevations, contaminating the air and propagating death.

The same mortality statistics that were spatially explained through elevation would also be framed temporally to demonstrate in which season cholera was most fatal. In his large foldout, *Eleven Divisions of England. Diagram Representing the Deaths from Cholera on Each Day of the Months of May, June, July, August, September, October, and November in*

the Year 1849 [Figure 3], Farr graphs cholera's mortality during the 1849 outbreak by regional areas.

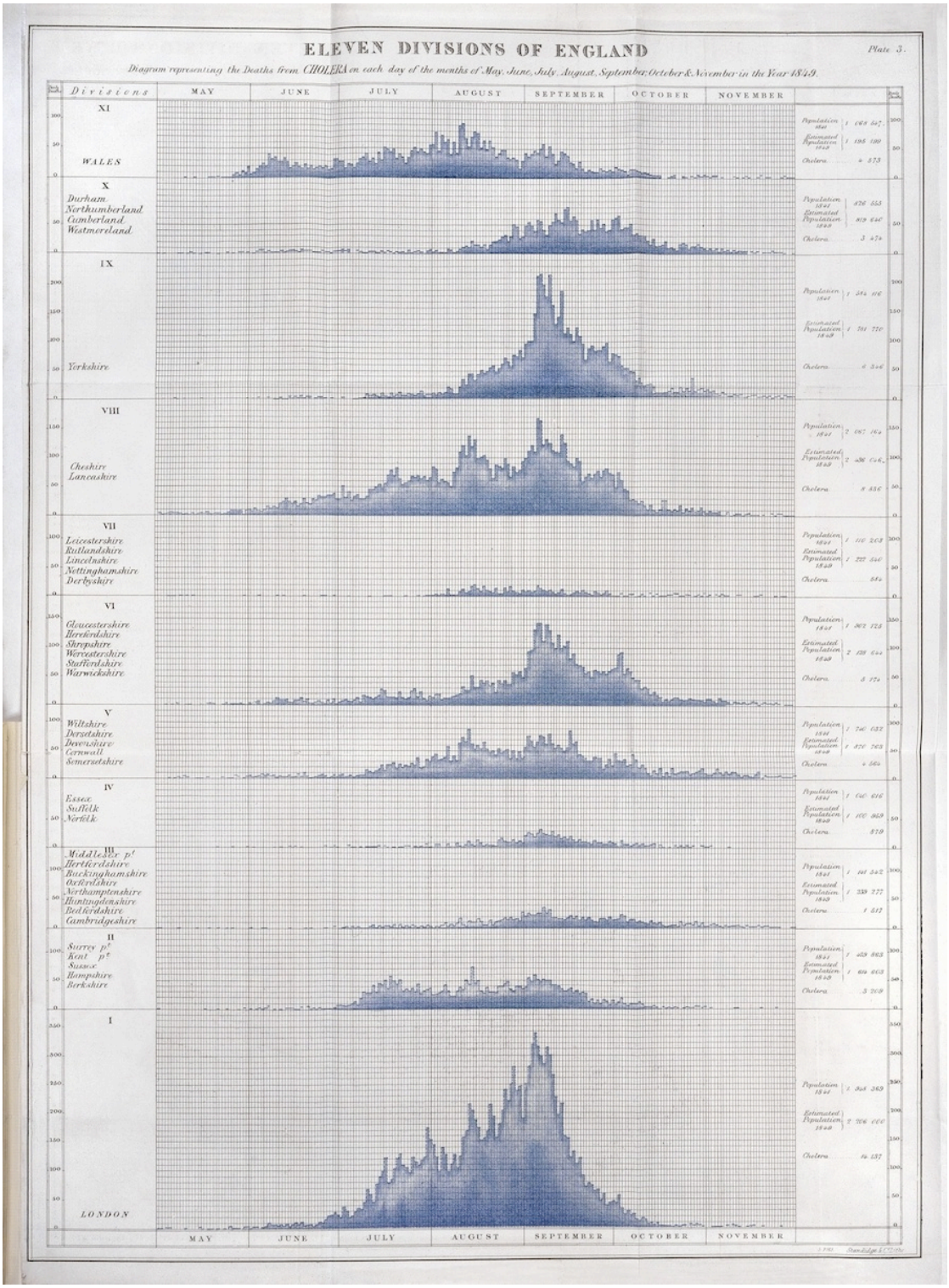

Figure 3: *Eleven Divisions of England. Diagram Representing the Deaths from Cholera on Each Day of the Months of May, June, July, August, September, October and November in the Year 1849*, in William Farr, *Report on the Mortality of Cholera in England, 1848–49* (London: W. Clowes and Sons, 1852), Plate 3. Wellcome Library, London. Credit: Wellcome Collection.

The mortality scale differs for each division, with some ranging from 0 to 50, 100, or 200. London's scale is the largest, with a range of 0 to 350. The mortality of each day is represented by a blue bar. Farr described the diagram as resembling 'sections of the primitive mountain formations, surmounted by spires and *aiguilles* of granite; or recall the lines of a strange Gothic architecture.'[45] The peaks and troughs of each graph may have reminded Farr of a Victorian city or landscape, but they also revealed the salubrity and insalubrity of different areas of England. Some divisions did not suffer from cholera as much as others. It is clear, though, that London faired the worst. Farr recorded that 14,137 people died of cholera in the metropolis in 1849. The bar graph reinforces this information by picturing the number of deaths that occurred each day. The blue bars reach above 50, often 100, and, sometimes, over 200 or 300 deaths per day during the epidemic. The metropolis, thus, had the largest blue 'mountain' of cholera deaths and the highest summit of mortality. Moreover, the blue shading grows darker near the bottom of each bar graph, visually evoking the cholera mist accumulating across the regions of England. Glaisher's *Diagram Exhibiting by Coloured Vertical Line the Deaths by Cholera and Diarrhoea on Each Day of the Five Months June–October for the Years 1853 and 1854* [Figure 4] takes on a similar form, using blue bars to indicate the daily number of deaths by cholera. He also included deaths caused by diarrhoea in yellow. The height of each yellow and blue bar indicates the mortality for each disease, and their combined height provides the total number of deaths from both illnesses. Unlike Farr, the uniformity of the blue colour in Glaisher's diagram mitigates the idea of a mist. What is clear in both Farr and Glaisher's images, though, is that epidemics of cholera emerged and were most fatal during the summer. Their graphs also reminded viewers that each square filled in with that blue tint, so characteristic of cholera, signified the number of Britons who had succumbed to the disease.

[45] Farr, *Report…1848–49*, xlviii.

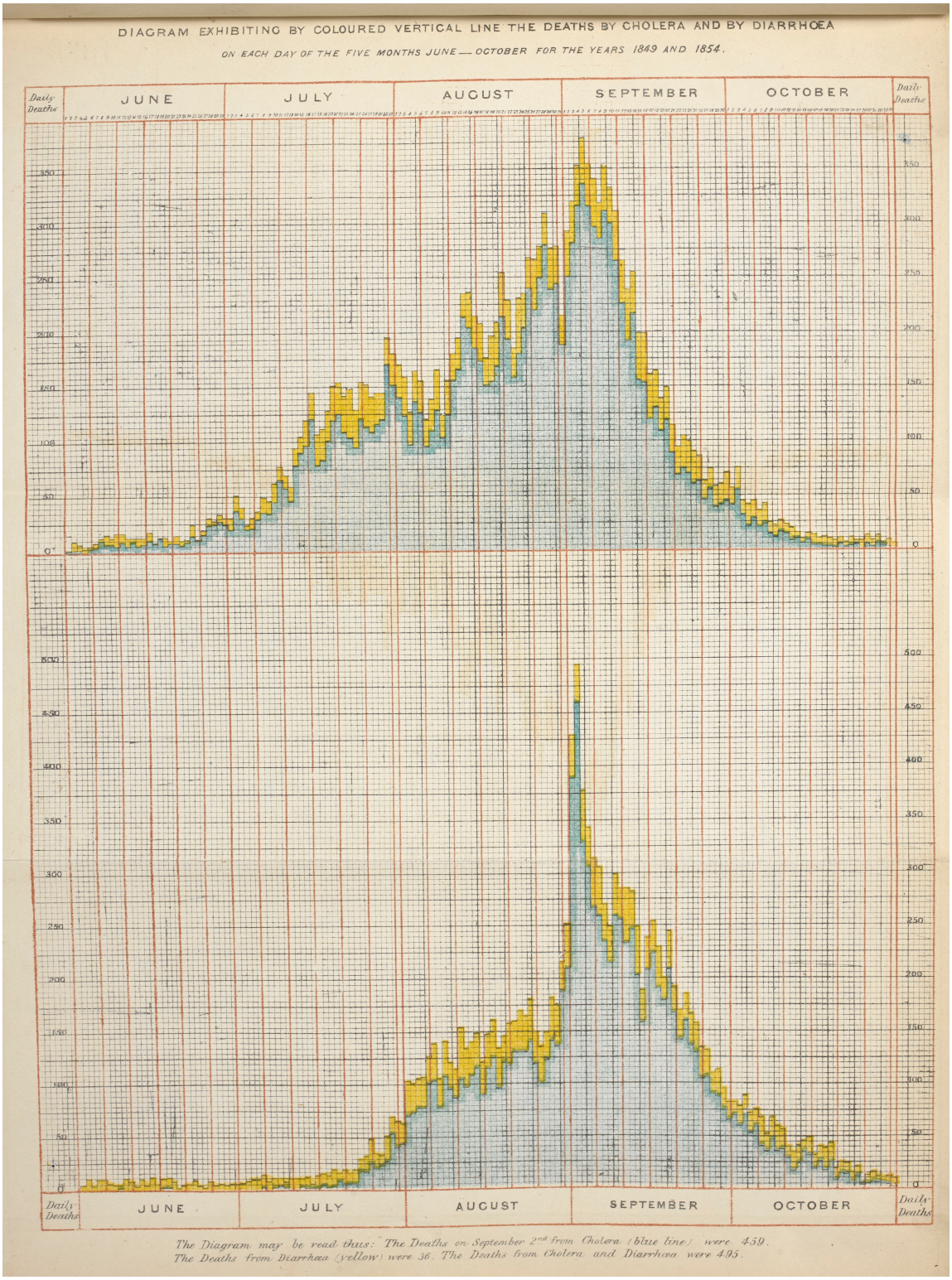

Figure 4: *Diagram Exhibiting by Coloured Vertical Line the Deaths by Cholera and Diarrhoea on Each Day of the Five Months June – October for the Years 1853 and 1854*, in James Glaisher, 'Report upon the Meteorology of London in Relation to the Cholera-Epidemic of 1853–4,' in GBH, Medical Council, *Appendix to the Report of the Committee for Scientific Inquiries in Relation to the Cholera-Epidemic of 1854* (George E. Eyre and William Spottiswoode, 1855), facing p. 32. British Library, London. Credit: © The British Library Board (RB.23.b.4684(5)).

For Victorian medics, the images discussed above indicated that cholera was a summer disease that affected lower elevations the most. What needed to be determined further were the exact factors that propagated cholera. Juxtaposing cholera mortality against measurements of atmospheric phenomena in single comprehensive diagrams, Farr and Glaisher served to substantiate the climatic theory through the very form of scientific representation. The reports that featured these images made clear that the data was gathered systematically and through detailed observation, from statistics recorded by the General Register Office and in meteorological diaries kept at stations set up across London (some created specifically for the study of the third epidemic). Through the collation of these multifarious observations, correlations were drawn between specific atmospheric phenomena and cholera.[46] Citing information provided by Glaisher, the GBH pointed out that during the second epidemic, London's temperatures were higher than normal, and the atmosphere was thick and still. The air was described as 'unusually stagnant' and 'very close and oppressive,' terms that were also used to depict the sickly climate of India.[47] In his report, Farr tracked the weather during the second epidemic and found that the temperature was above average, with a sudden rise correlating to an increase in cholera deaths, while in his report on the meteorology of London during the third epidemic (commissioned by the GBH), Glaisher concluded that 'in all cases, the reading of the barometer was remarkably high and the atmosphere thick, […] the temperature was above its average, and a total absence of rain, and a stillness of air amounting almost to calm, accompanied the progress of the disease.'[48] What emerges from these findings is that cholera was a malady of an irregular climate and a warm atmosphere heavy with matter.

To make visible the arguments made in their reports, Farr and Glaisher included large foldout diagrams that condensed the meteorological and medical data. In Farr's *All England.*

[46] GBH, *Report…1854*, 24–25; and Farr, *Report…1848–49*, i–iii.
[47] GBH, *Report…1849*, 26–27; and James Jameson quoted in Annesley, *Researches*, 1: 105–107.
[48] Farr, *Report…1848–49*, xxiii–xxviii; and Glaisher, 'Report,' 116.

Diagram Representing the Deaths from Cholera and Diarrhoea on Each Day of the Year 1849. With the Meteorological Phenomena Registered at Greenwich on the Corresponding Days [Figure 5], a significant amount of meteorological data — including barometric pressure, wind speed and direction, rainfall, and temperature — was recorded alongside the mortality for cholera (the blue bars) and diarrhoea (the yellow bars) for every day of 1849.

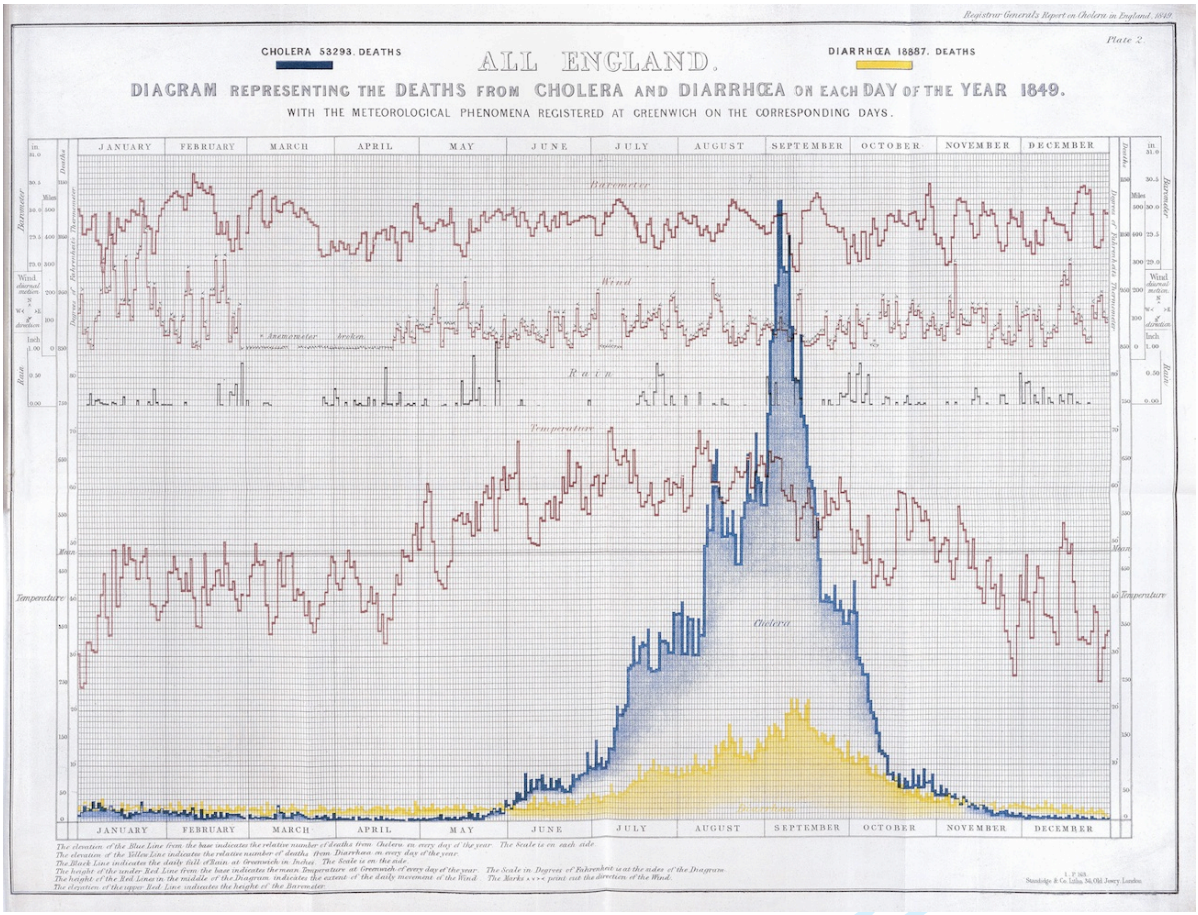

Figure 5: *All England. Diagram Representing the Deaths from Cholera and Diarrhoea on Each Day of the Year 1849. With the Meteorological Phenomena Registered at Greenwich on the Corresponding Days*, in William Farr, *Report on the Mortality of Cholera in England, 1848–49* (London: W. Clowes and Sons, 1852), Plate 2. Wellcome Library, London. Credit: Wellcome Collection.

Borrowing Farr's visual language, Glaisher produced a similar diagram of the third epidemic. Titled *London. Diagram Representing the Deaths from Cholera and Diarrhoea on Each Day of the Year 1854 with the Principle Daily Meteorological Phenomena* [Figure 6], it also records various atmospheric measurements, such as barometric pressure, temperature, direction and pressure of the wind, rainfall, density of cloud in the sky, and the proportion of

fog or mist, against cholera mortality. The diagrams provided viewers with both an overview of the state of England's climate during the epidemics and detailed statistics measuring components of the atmosphere on each day of the year. Placed alongside the reports, the images allowed viewers to analyse the information closely to confirm the theory discussed in the text or to determine the correlations for themselves.

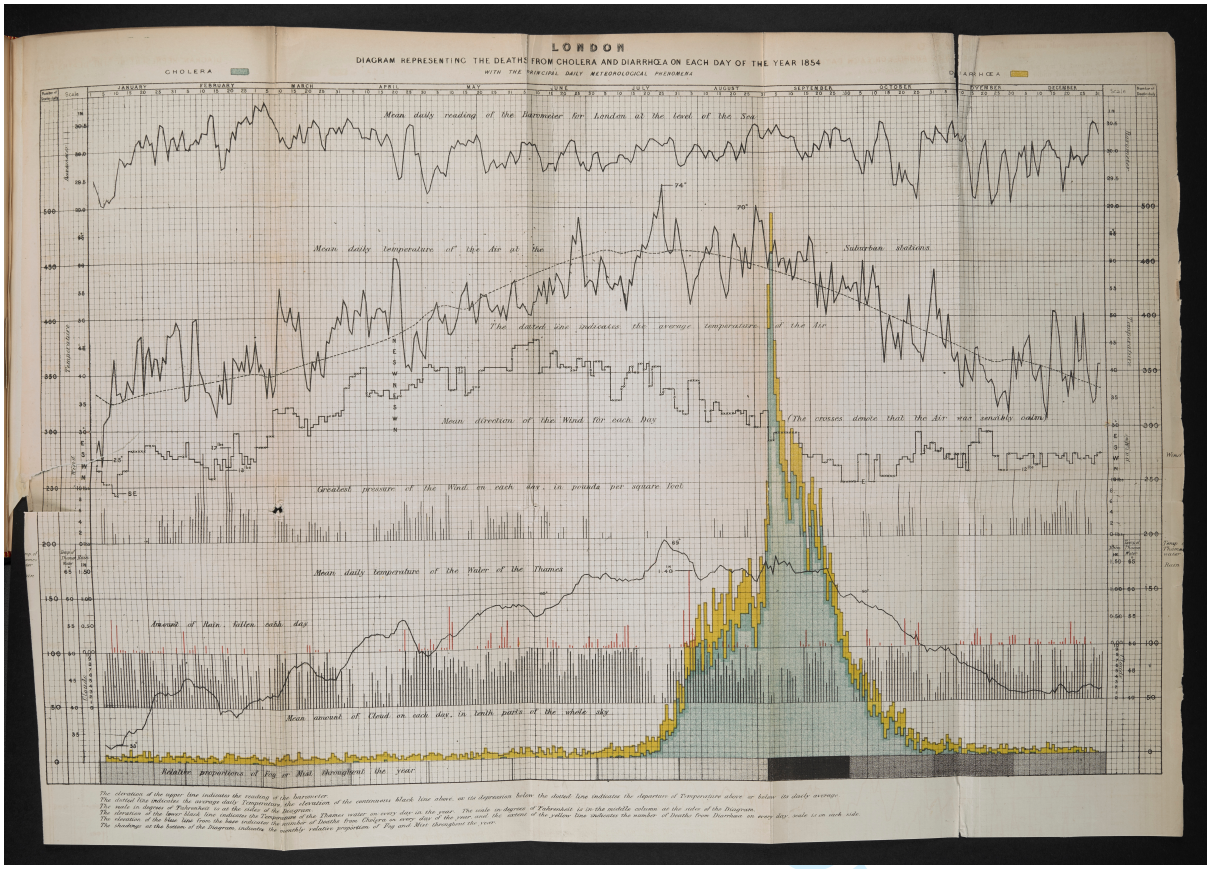

Figure 6: *London. Diagram Representing the Deaths from Cholera and Diarrhoea on Each Day of the Year 1854 with the Principal Daily Meteorological Phenomena*, in James Glaisher, 'Report upon the Meteorology of London in Relation to the Cholera-Epidemic of 1853–4,' in GBH, Medical Council, *Appendix to the Report of the Committee for Scientific Inquiries in Relation to the Cholera-Epidemic of 1854* (George E. Eyre and William Spottiswoode, 1855), facing p. 106. British Library, London. Credit: © The British Library Board (RB.23.b.4684(5)).

In simplifying and ordering the data through the structure of the diagram, the images attempt to make disease legible and rational to the viewer; yet, the threat posed by cholera is still visible. The deaths by cholera are represented by its characteristic blue. While Glaisher's diagram flattens the blue of cholera's mortality, Farr's graph uses gradation, likely so that the blue did not obscure the yellow bars of diarrhoea mortality. In doing so, however, cholera

mortality was pictured as hazy matter (here, concentrating at the top of each bar), visually evoking those miasmas described as mixing with the atmosphere. The fogs associated with cholera did not escape representation in Glaisher's diagram either. The gradation bar at the bottom recorded the proportion of mist during the year. As cholera begins to spread, the bar darkens, then abruptly becomes black during the most fatal days of the outbreak and fades back to grey as the number of deaths slowly decreases. The gradation represents the density of the cholera mist during the epidemic, and stresses how the disease was most deadly when this fog was at its thickest. The black bar visually evokes that atmosphere weighted with miasma that was associated with cholera. Moreover, the blue peak formed by the mortality bars almost reaches to the top of each diagram and in Farr's image, in particular, they seem to loom over the page. It is as if the disease is just barely being contained by the discrete squares of the graph.

More significantly, by mapping meteorological and mortality data together, the diagrams draw a causal link between the atmosphere and cholera. Here, data was used to support theory and opinion. For instance, close study of the diagrams revealed discrepancies with arguments made in the texts. These deviations were often noted and not discussed further (such as the reappearance of mist after the epidemic in Glaisher's diagram), or explained away through an acknowledgment that many atmospheric variants remained unknown and simply required further study. Overall, the reports concluded that the cholera epidemics did possess 'marked meteorological characters.'[49] As the work of Farr and Glaisher demonstrates, there was a growing sense in the nineteenth century of the importance of critical scientific investigation and data gathering in unravelling the mystery of epidemic disease. Glaisher confidently declared that if a careful investigation and assembling of data on the meteorology of the country is conducted,

[49] Farr, *Report…1848–49*, xxiii–xxviii and lxix; and GBH, *Report…1854*, 26–34.

> in a short time we should be in a condition to elucidate a clear insight into the meteorological causes of cholera, influenza, and many phases of disease which now burst upon us with the suddenness and devastating power of a divine and wrathful visitation.[50]

In this process, images became crucial visual evidence; they made the theory true through representation that claimed to be objective. Framed within the lines of the graph, with its highly detailed and carefully recorded measurements, the images ostensibly confirmed that the emergence of cholera corresponded to certain climatic conditions. Further, this atmosphere was likened to the climate of India. In his research, Hingeston mentioned that he had the opportunity to speak 'with those who lived in the East when cholera has prevailed' and from their information he was able 'to gather some corroborative evidence of the same state of the atmosphere, as that which I have had occasion to remark in this country being observable at the time.'[51] In attempting to prove the atmospheric origins of the disease, scientific studies of cholera's environment implied a troubling notion: that the English climate may not have been so different to the insalubrious Indian climate.

Victorian medics understood that images could be powerful tools in supporting medical theories and strove to present their data in visually striking ways as well. For instance, a popular method to represent meteorological information was to display it in a circular diagram, using line and colour to record such measurements as wind speed and direction, and fluctuations in annual temperature.[52] In his report, Farr included two foldout plates that framed the mortality of cholera within circular representations of the year. Farr explained that his diagrams were a new, compact form that he modified from the dial arrangement in general use and were ideal for illustrating periodic phenomena, stating it

[50] Glaisher, 'Report,' 78–79.
[51] J. A. Hingeston, 'Further Observations on the Atmospheric Changes Relating to Cholera,' *AMJ* 2, no. 79 (1854): 597.
[52] For examples, see Luke Howard, *The Climate of London, deduced from Meteorological Observations, made at Different Places in the Neighbourhood of the Metropolis*, Vol. 2 (London: W. Phillips, 1820), Plates I and II; and Robert FitzRoy, *Weather Book: A Manual of Practical Meteorology* (London: Longman, Green, Longman, Roberts, and Green, 1863), 414.

'makes the diagram represent the facts in a striking manner to the eye.'[53] These circular charts were designed to present information in a more easily accessible form than the dense complexity of the previous graphs. They not only served to display information clearly, they were seen as having a significant impact on the way it was presented to the viewer, making visible, tangible, and measurable the correlation between atmospheric phenomena and mortality rates. In *Temperature and Mortality of London for Every Week of 11 Years (1840–1850)* [Figure 7], Farr used circular diagrams to picture the rate of mortality and the temperature of London for a decade, including the year in which the second cholera epidemic occurred. Twelve circles are arranged in three rows on the page. The first eleven circles contain the data for each year from 1840 to 1850, and the last circle combines the data for the years 1840 to 1849 in order to provide an average for this period. As Farr explains, the distance between each circle represents 10° of temperature or 100 deaths; the radii represent the weeks of the year; and the two circles, one marked with yellow and black and the other with blue and red, represent respectively the average weekly deaths and the mean temperature, with the black denoting excessive mortality, the yellow salubrity, the red excess heat, and the blue excess cold.[54] By comparing the circles of the eleven years, the viewer learns that generally London has two healthy seasons (spring and autumn) and two unhealthy seasons (summer and winter).[55] A quick glance shows that the black of excess mortality often appears at the bottom of each circle, during the winter months. Significant spikes in winter mortality, such as in the years 1847 and 1848, were linked to epidemics of several diseases, including typhus and influenza.[56] The circular diagram for 1849, the year of the cholera epidemic, reveals that this disease, which originated in the tropical climate of India, was

[53] Farr, *Report…1848–49*, xlviii. Farr based his diagrams on the compass form, which was created by Matthew Fontaine Maury and adapted by the meteorologist Robert FitzRoy into 'wind stars' to represent the strength and direction of winds encountered by ships. The point of these weather diagrams, Anderson explains, was to 'compress multiple observations into an instantly accessible visual record' (Anderson, *Weather*, 189–190).
[54] Farr, *Report…1848–49*, Plate 4.
[55] Farr, *Report…1848–49*, xlviii.
[56] Farr, *Report…1848–49*, x.

unlike other epidemic illnesses. As the diagram makes clear, cholera prevailed in the summer, when temperatures were excessively high, and had the most significant impact on the mortality rate of London (the farthest point pictured would be at 3000 deaths per week) than the other years and epidemics.

Figure 7: *Temperature and Mortality of London for Every Week of 11 Years (1840–1850)*, in William Farr, *Report on the Mortality of Cholera in England, 1848–49* (London: W. Clowes and Sons, 1852), Plate 4. Wellcome Library, London. Credit: Wellcome Collection.

The black patch of cholera's excessive mortality also escapes the order imposed by the diagram. It spreads well beyond the borders of the circle and, like the tint of the cholera mist and the disease's effects on the body, stains the white page. Cholera could not be contained by the formalities of circumference.

The grey and blue haze that marked cholera's presence in the meteorological diagrams could even escape into other graphic forms, where it was able to contaminate the

landscape of the nation. In a large foldout map [Figure 8] included in his report, Farr represented cholera's diffusion across England as a grey haze.

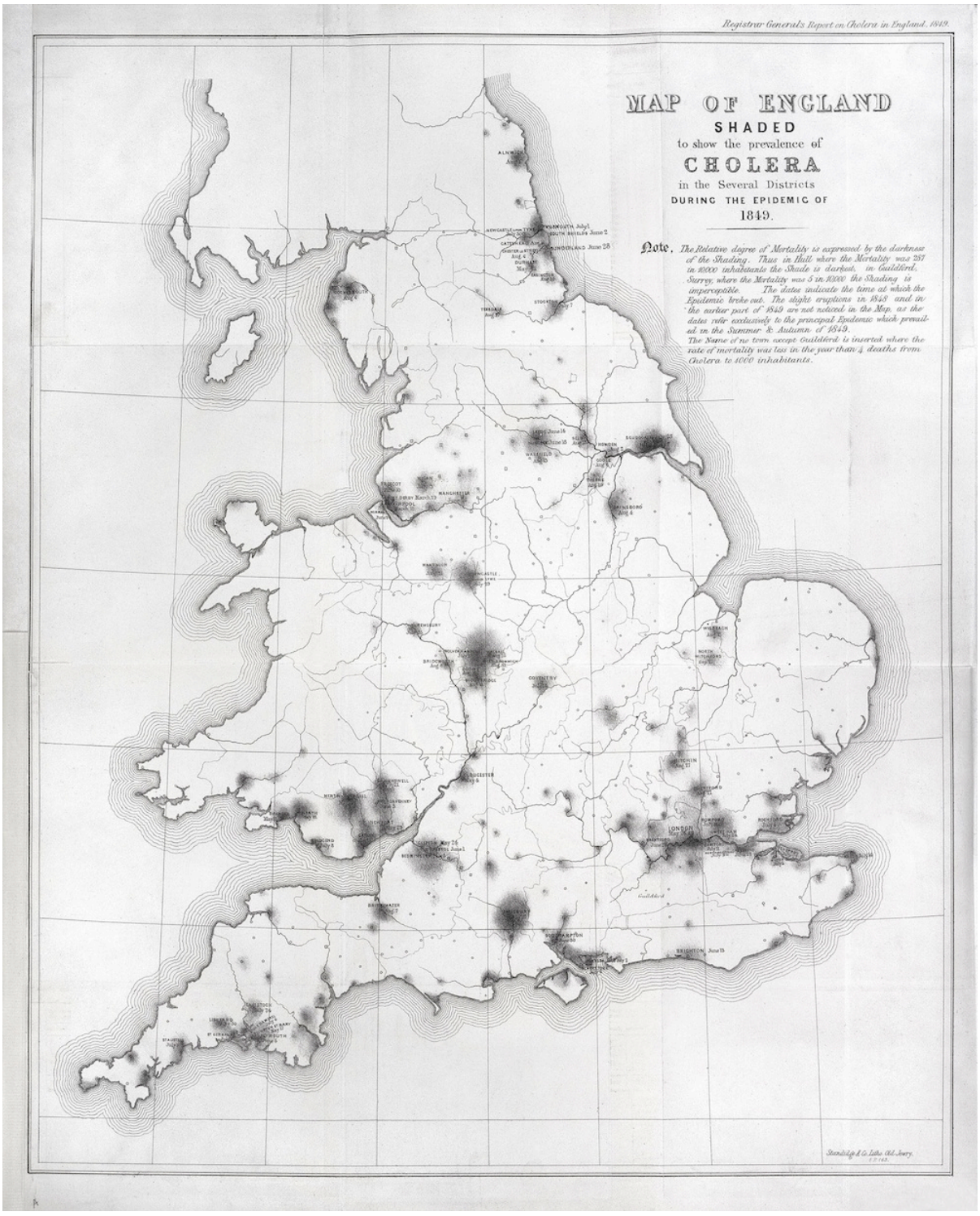

Figure 8: *Map of England Shaded to Show the Prevalence of Cholera in the Several Districts During the Epidemic of 1849*, in William Farr, *Report on the Mortality of Cholera in England, 1848–1849* (London: W. Clowes and Sons, 1852), Plate 1. Wellcome Library, London. Credit: Wellcome Collection.

The depth of the grey shade expresses the mortality rate of each outbreak, with the dark grey areas stressing the severity of cholera and the light grey areas showing a milder experience. More than visualizing the mortality rates of the epidemic, the representation of cholera as a grey shade conjures the belief in a cholera mist. In his explanation of the map, Farr described the colouring as 'shadows on the face of the country,' a 'dark shade [that] rests,' 'extends,' or 'descends' on a town, and a 'thick and dark' 'misty shadow' that 'grows cloudy.' Across England, it 'stained,' 'enshrouded,' or 'covered with a mass of darkness, that the light points […] can scarcely pierce.'[57] In the map, cholera becomes a grey miasma, a thick, dark, matter-filled atmospheric agent that erupts on the surface of the page, and blemishes England the way it stains the body of its victims. Furthermore, this shade could spread out from one city to other locations. For instance, according to Farr,

> London was the centre of a great system of attack which extended to Hertford and Hitchin, West Ham, Romford and Rochford on the north side of the Thames, to Dartford and Gravesend, Margate and Ramsgate, Dover, Croydon and Brighton, in Kent and Sussex.[58]

The grey stain of cholera emerged from the metropolis and tainted the rest of the region. As Farr's map implies, London, the centre of the empire, was contaminating the nation.

The sickly condition of London's atmosphere was also visualized in *Cholera Map of the Metropolis. 1849. Exhibited in the Registration Districts* [Figure 9], a large foldout map that accompanied R. D. Grainger's report on the second epidemic for the GBH. The blue tint represents the mortality across the city, with the depth of the colour indicating the severity of cholera in a particular area. What is most striking is how the blue of cholera's mortality appears to seep into the paper and the city. Some areas of white do appear, portraying these spaces as salubrious, but the majority of the city is covered in blue, picturing how sickly London really was. The blue on Grainger's map is an amorphous stain that extends unevenly

[57] Farr, *Report…1848–49*, vi–vii.
[58] Farr, *Report…1848–49*, xxiii.

over the boundaries of London. It has a real, material presence that blemishes the surface and soaks into the white purity of the page. Almost no part of London appears to have escaped the contamination of the malignant matter of cholera.

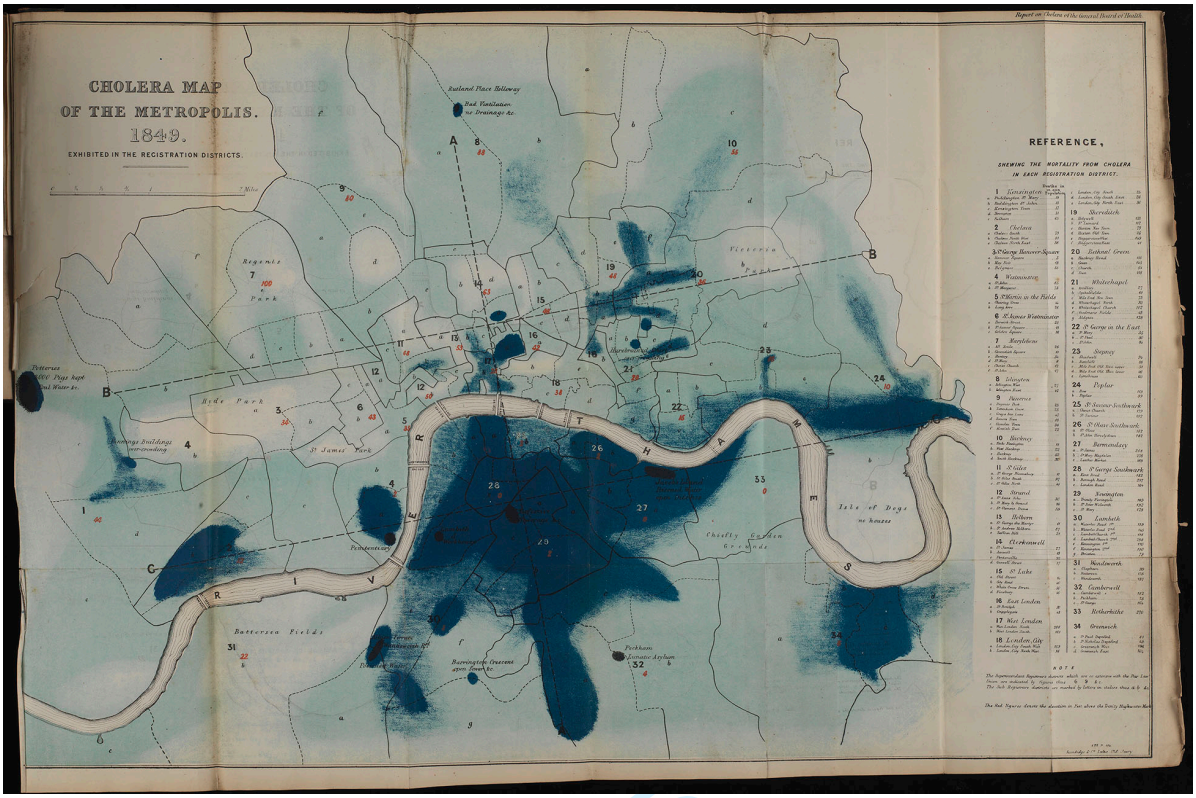

Figure 9: *Cholera Map of the Metropolis. 1849. Exhibited in the Registration Districts*, in R. D. Grainger, *Appendix (B) to the Report of the General Board of Health on the Epidemic Cholera of 1848 and 1849* (London: W. Clowes and Sons, 1850), facing p. 200. Wellcome Library, London. Credit: Wellcome Collection.

The blue tint also visualized the infiltration of the disease in London. Printed with Grainger's map was *Sections Shewing the Relative Intensity of the Attack of Cholera at the Various Levels Along the Lines Marked on the Cholera Map* [Figure 10], which represents the elevation and mortality of cholera along three axes across the city. In Grainger's cholera map, three dotted lines cut across the landscape. These correspond to the three sections in his second image, which shows the changes in elevation by height and the severity of cholera by blue tint along each line.[59] In both Grainger's map and diagram cholera is not just a hazy

[59] R. D. Grainger, *Appendix (B) to the Report of the General Board of Health on the Epidemic Cholera of 1848 and 1849* (London: W. Clowes and Sons, 1850), 32.

miasma settling over the metropolis; it is a disease that seeps into the land, contaminating both its surface and core.

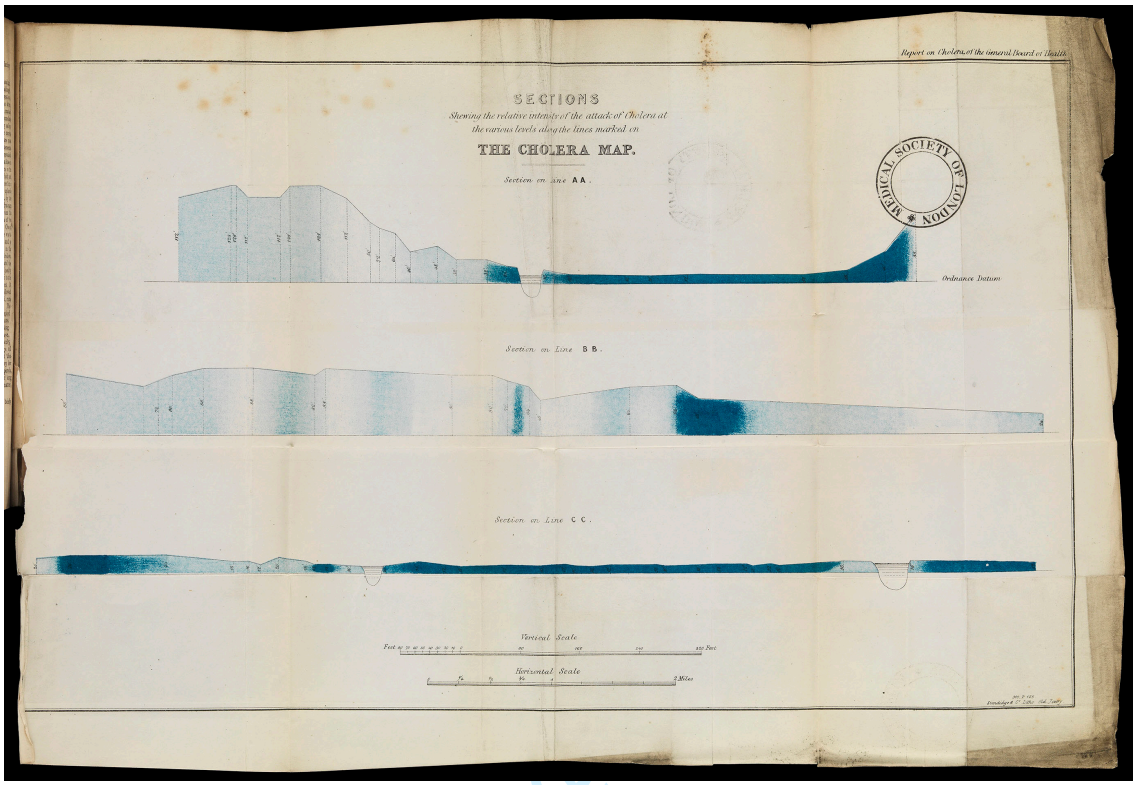

Figure 10: *Sections Shewing the Relative Intensity of the Attack of Cholera at the Various Levels Along the Lines Marked on the Cholera Map*, in R. D. Grainger, *Appendix (B) to the Report of the General Board of Health on the Epidemic Cholera of 1848 and 1849* (London: W. Clowes and Sons, 1850), facing p. 200. Wellcome Library, London. Credit: Wellcome Collection.

The diagrams produced by Victorian medics in their studies of the cholera epidemics reflected a larger concern for the need to understand the disease. As part of the effort to know what propagated this new deadly type of cholera, medics identified the ostensibly sickly climate of India as its original source. From here, cholera seemed to spread to England through the air, where it appeared to develop during particular periods of irregular weather most notably marked by a thick coloured mist. In an effort to support these beliefs, images juxtaposing meteorological measurements with cholera mortality rates were produced to prove the relationship between the disease and atmospheric conditions. By displaying atmospheric and medical data together, data that was gathered through careful scientific and statistical investigation, the images visibly associated cholera with certain atmospheric

conditions and established this theory as fact. In doing so, the diagrams also implicitly suggested another connection — one between British and Indian environments. Measured and visualised through the ordered structure of the diagrams, cholera ostensibly circulated through England as a result of a state of the air resembling a tropical climate heavy with miasma and visibly ill.

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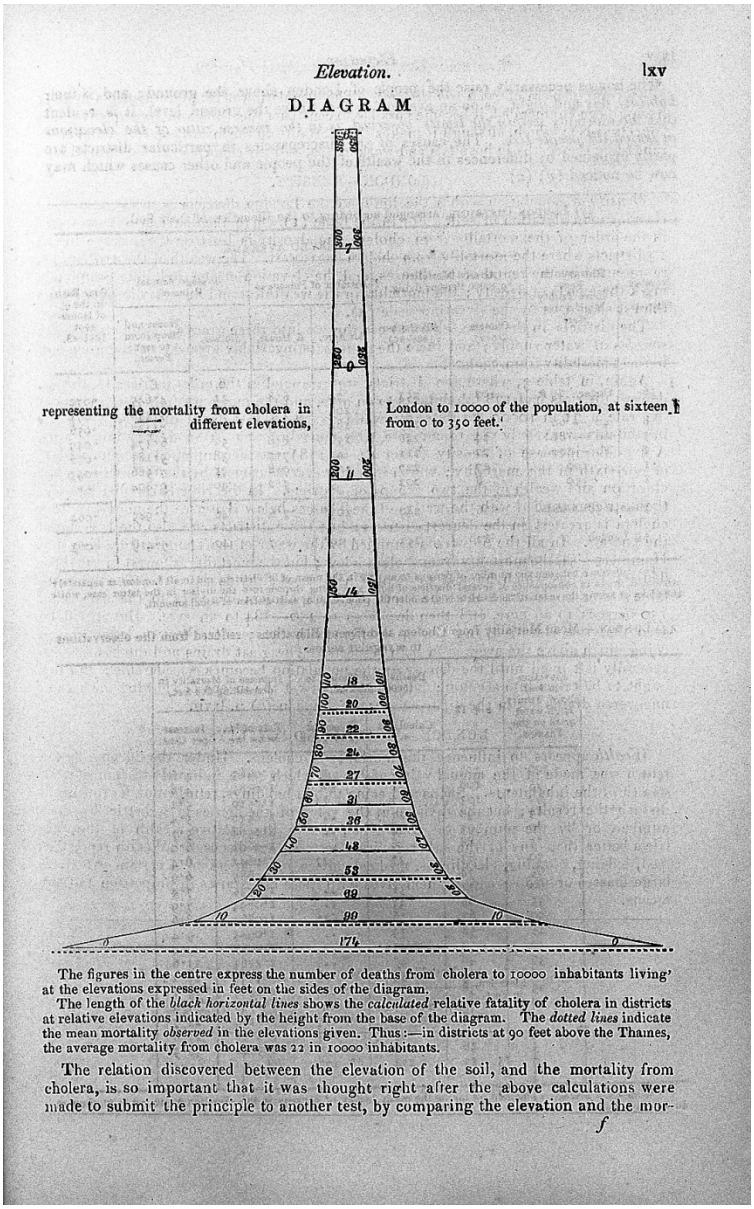

Figure 1: Diagram Representing the Mortality from Cholera in Different Elevations, in William Farr, Report on the Mortality of Cholera in England, 1848–49 (London: W. Clowes and Sons, 1852), lxv. Wellcome Library, London. Credit: Wellcome Collection.

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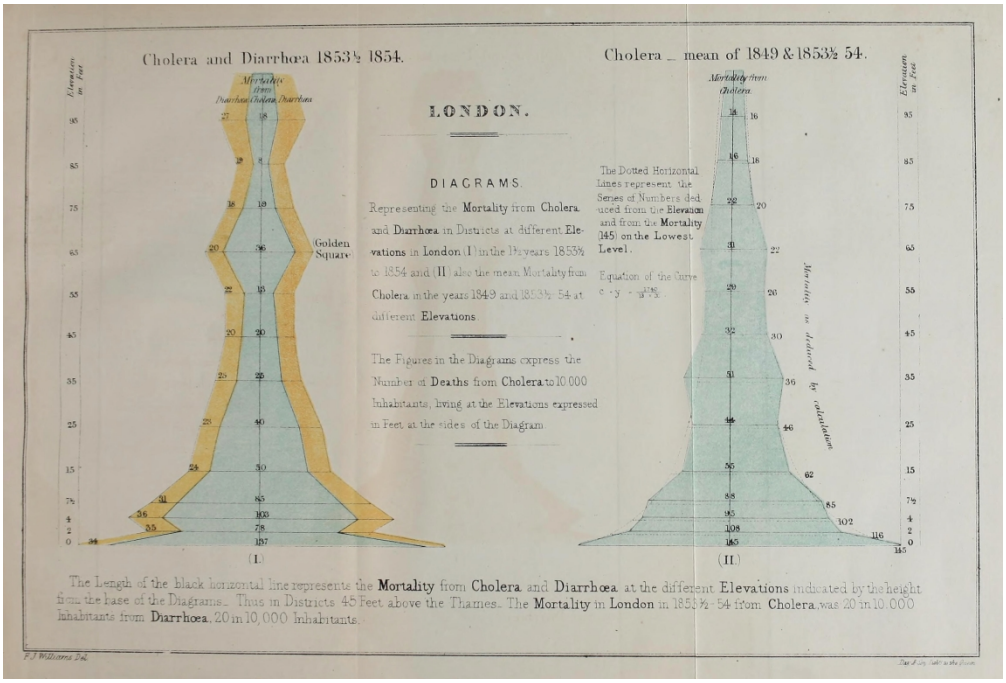

Figure 2: Diagrams. Representing the Mortality from Cholera and Diarrhoea in Districts at Different Elevations in London, in James Glaisher, 'Report upon the Meteorology of London in Relation to the Cholera-Epidemic of 1853–4,' in GBH, Medical Council, Appendix to the Report of the Committee for Scientific Inquiries in Relation to the Cholera-Epidemic of 1854 (George E. Eyre and William Spottiswoode, 1855), facing p. 32. Wellcome Library, London. Credit: Wellcome Collection.

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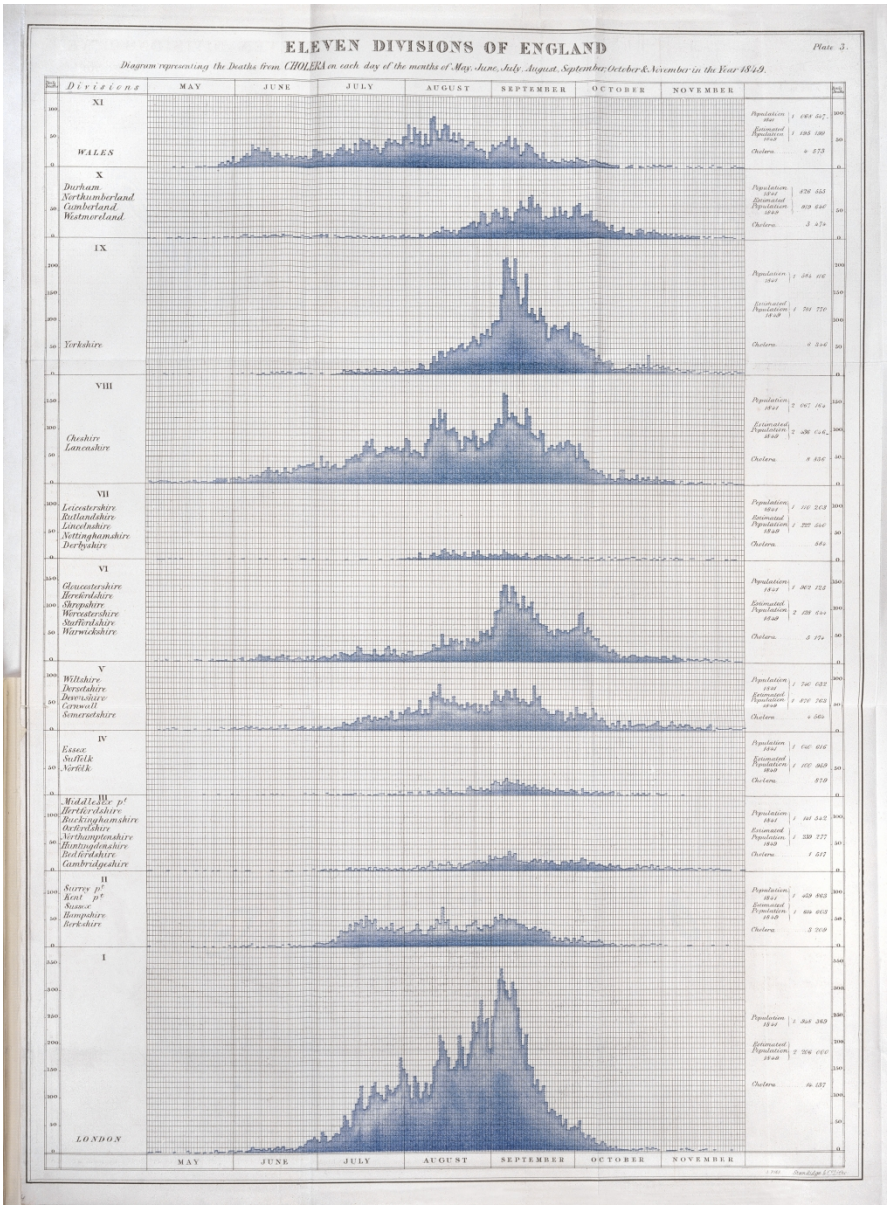

Figure 3: Eleven Divisions of England. Diagram Representing the Deaths from Cholera on Each Day of the Months of May, June, July, August, September, October and November in the Year 1849, in William Farr, Report on the Mortality of Cholera in England, 1848–49 (London: W. Clowes and Sons, 1852), Plate 3. Wellcome Library, London. Credit: Wellcome Collection.

304x413mm (300 x 300 DPI)

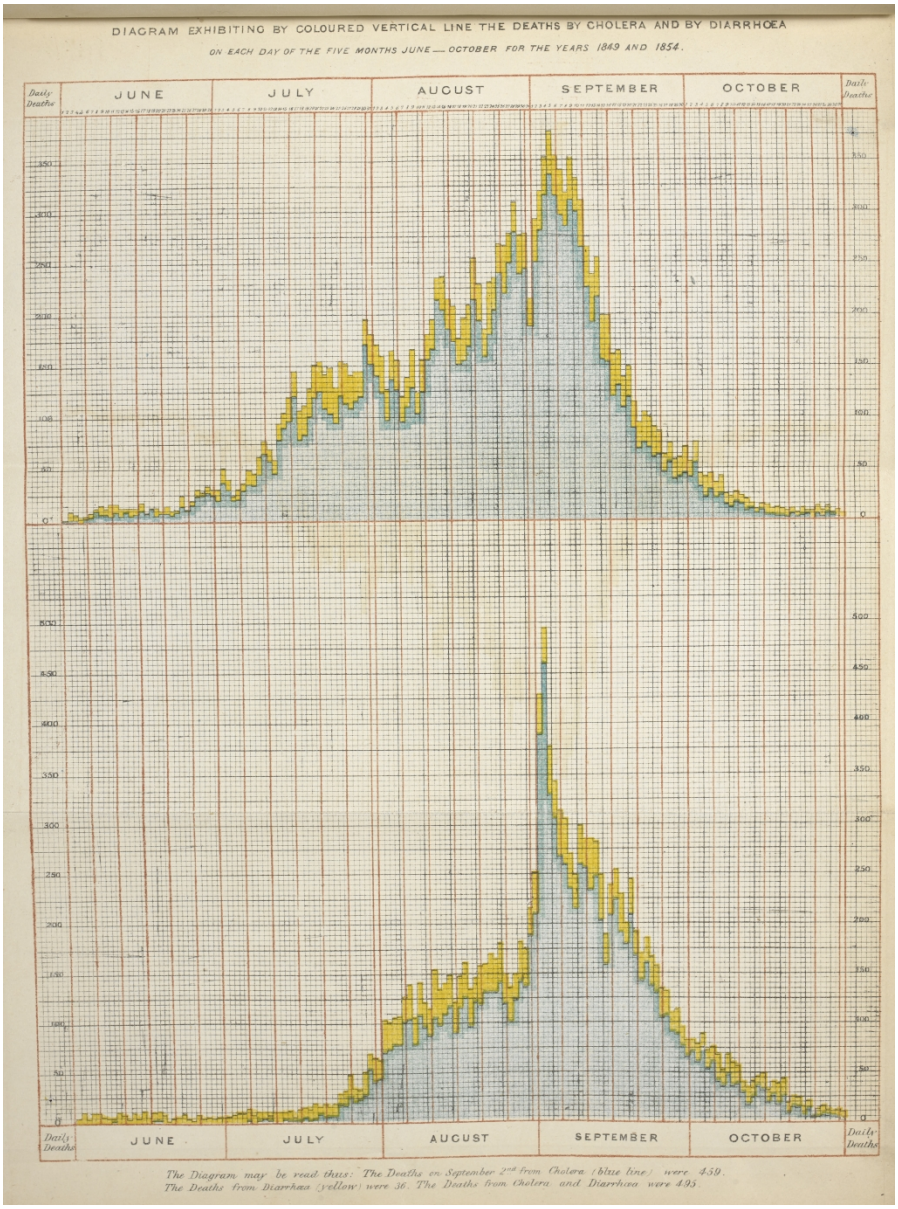

Figure 4: Diagram Exhibiting by Coloured Vertical Line the Deaths by Cholera and Diarrhoea on Each Day of the Five Months June – October for the Years 1853 and 1854, in James Glaisher, 'Report upon the Meteorology of London in Relation to the Cholera-Epidemic of 1853–4,' in GBH, Medical Council, Appendix to the Report of the Committee for Scientific Inquiries in Relation to the Cholera-Epidemic of 1854 (George E. Eyre and William Spottiswoode, 1855), facing p. 32. British Library, London. Credit: © The British Library Board (RB.23.b.4684(5)).

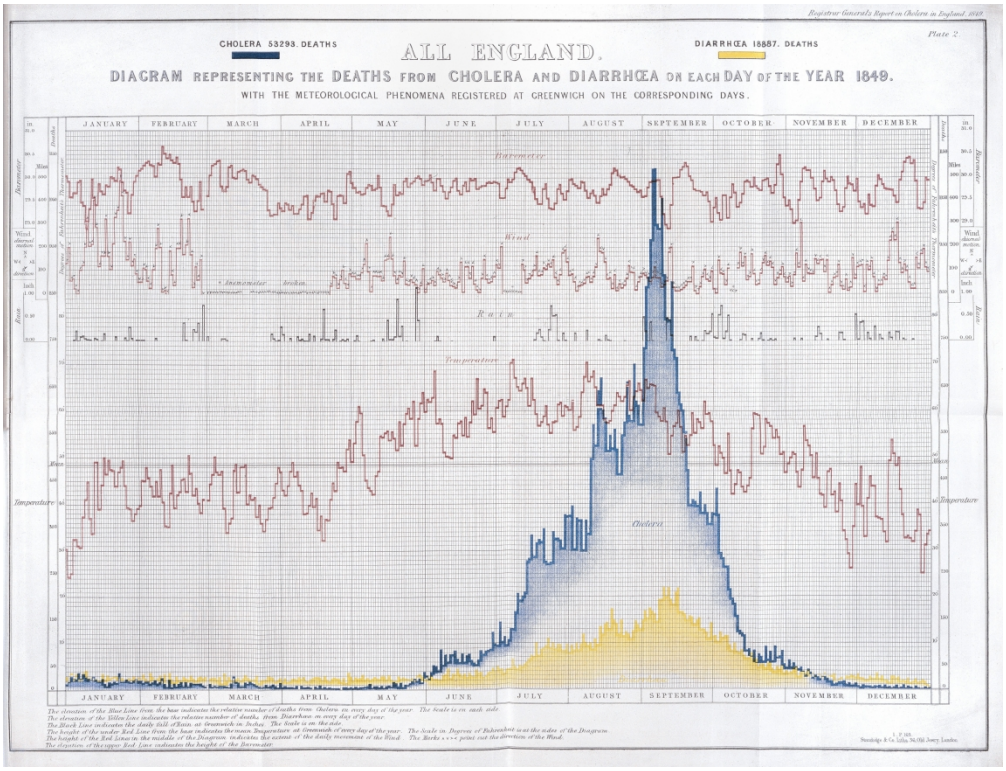

Figure 5: All England. Diagram Representing the Deaths from Cholera and Diarrhoea on Each Day of the Year 1849. With the Meteorological Phenomena Registered at Greenwich on the Corresponding Days, in William Farr, Report on the Mortality of Cholera in England, 1848–49 (London: W. Clowes and Sons, 1852), Plate 2. Wellcome Library, London. Credit: Wellcome Collection.

406x309mm (300 x 300 DPI)

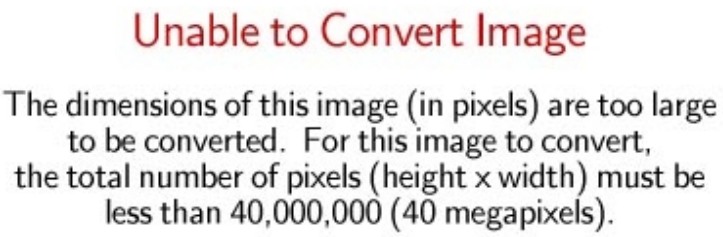

Figure 6: London. Diagram Representing the Deaths from Cholera and Diarrhoea on Each Day of the Year 1854 with the Principal Daily Meteorological Phenomena, in James Glaisher, 'Report upon the Meteorology of London in Relation to the Cholera-Epidemic of 1853–4,' in GBH, Medical Council, Appendix to the Report of the Committee for Scientific Inquiries in Relation to the Cholera-Epidemic of 1854 (George E. Eyre and William Spottiswoode, 1855), facing p. 106. British Library, London. Credit: © The British Library Board (RB.23.b.4684(5)).

Figure 7: Temperature and Mortality of London for Every Week of 11 Years (1840–1850), in William Farr, Report on the Mortality of Cholera in England, 1848–49 (London: W. Clowes and Sons, 1852), Plate 4. Wellcome Library, London. Credit: Wellcome Collection.

466x367mm (300 x 300 DPI)

Figure 8: Map of England Shaded to Show the Prevalence of Cholera in the Several Districts During the Epidemic of 1849, in William Farr, Report on the Mortality of Cholera in England, 1848–1849 (London: W. Clowes and Sons, 1852), Plate 1. Wellcome Library, London. Credit: Wellcome Collection.

318x393mm (300 x 300 DPI)

Figure 9: Cholera Map of the Metropolis. 1849. Exhibited in the Registration Districts, in R. D. Grainger, Appendix (B) to the Report of the General Board of Health on the Epidemic Cholera of 1848 and 1849 (London: W. Clowes and Sons, 1850), facing p. 200. Wellcome Library, London. Credit: Wellcome Collection.

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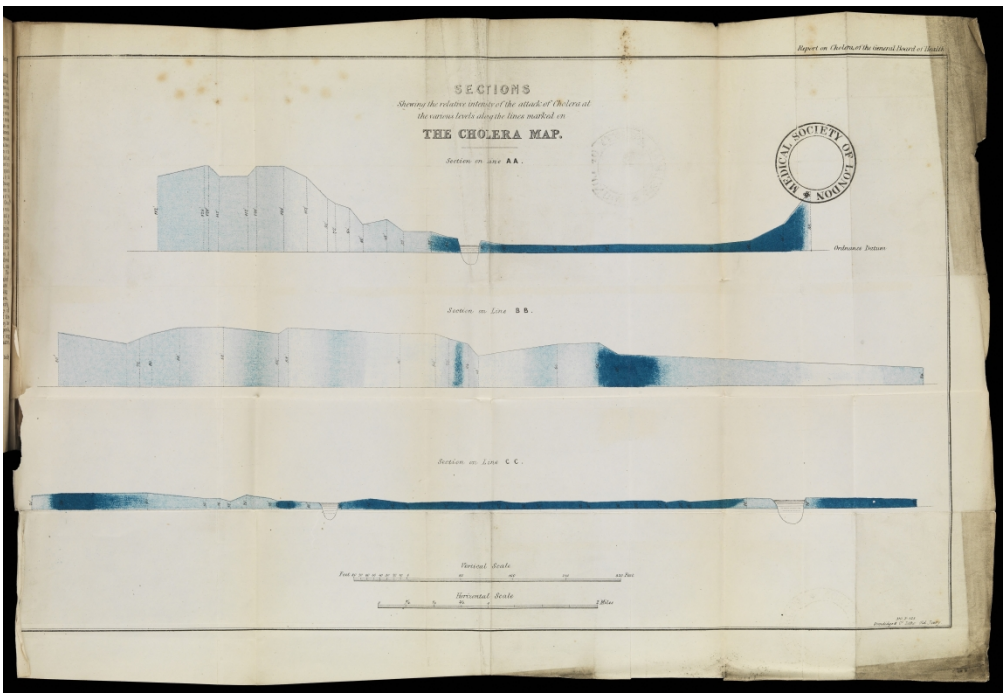

Figure 10: Sections Shewing the Relative Intensity of the Attack of Cholera at the Various Levels Along the Lines Marked on the Cholera Map, in R. D. Grainger, Appendix (B) to the Report of the General Board of Health on the Epidemic Cholera of 1848 and 1849 (London: W. Clowes and Sons, 1850), facing p. 200. Wellcome Library, London. Credit: Wellcome Collection.

468x321mm (300 x 300 DPI)